Traffic Flow For Traveler Information Systems

- Traffic congestion costs $70B a year
  - Road construction can't keep up with demand
  - Congestion spreading to smaller cities
  - Many DOT data systems focus on operations not traveler information
  - Improvements compete for investment and operating funds

- Real-time flow data solutions can:
  - Improve existing infrastructure utilization
  - Improve financial efficiency and flexibility
  - Provide more comprehensive coverage at less cost
  - Enhance data quality and reliability
  - Enable actionable, real-time decision-making
  - Improve planning, modeling and reporting

- High-quality, real-time traffic data changes the game
  - Drivers make better choices saving time, money, gasoline, pollution
  - Traffic congestion load is spread over time and space
  - Public increases awareness of Transportation agency benefits

- **Sensor**
  - Solar powered
  - Wireless communications
  - Fast installation
  - Lightweight, reliable, and accurate
  - Low cost
  - >800 installed to date

- **Server Farm**
  - Manages sensor network
  - Validates and formats data
  - Integrates public data sources

- **Data Client**
  - Streams XML feed to customers

- **Sensor**
  - License free – 24.125GHz
  - Range 1800 ft, bi-directional
    - Single device measures both sides of roadway
  - Accuracy: 0.1mph, avg. +/- 3mph
  - Installs on existing infrastructure
    - Install time 15-20 minutes
  - Solar: 5W or 10W
    - Sealed lead acid batteries
    - 21 days of operation without photons
  - Weight: 16 lbs
    - Small profile, negligible wind loading
  - Programmable sampling rates
    - Default 2 measurements/minute
    - Adaptive reporting rates
  - Data Backhaul – ATT Wireless GPRS
    - Full Duplex
  - External Power and Communication port

- **Highway loops**
  - 1200 sensors
  - 15 years
  - >$120m investment
  - Half are out of service
  - 30% coverage

- **Toll Tags**
  - 780,000 toll tags
  - 5 years
  - >$18m investment
  - 10% coverage

- **SpeedInfo Sensors**
  - 324 sensors
  - 45 days
  - <$400K investment
 - 60% coverage
  - Primary 511 data source
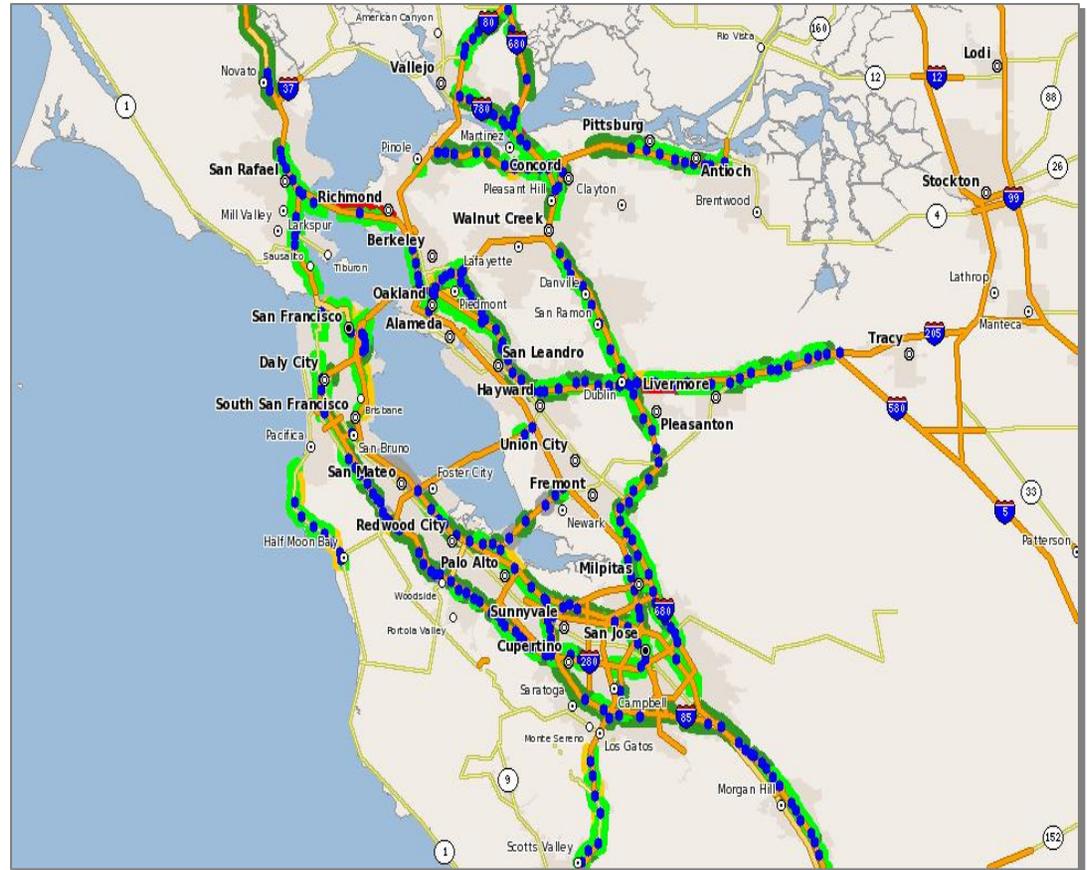
- NDOR contract

- 70 sensor network to supplement and feed 511 system, TMC

- >200 miles coverage at 1 mile separation on I-80 metro corridors and Hwy 6

- Data used for analysis and to provide flow, travel times and construction zone coverage for bypass roads

- http://map.speedinfo.com/usa/nebraska/index.php

- dDOT Contract

- 50 sensor network to instrument all major arterial evacuation routes

- System data to be used to evaluate emergency signal timing patterns and transportation communication protocols and flow model

- SpeedInfo XML feed integrated into data center
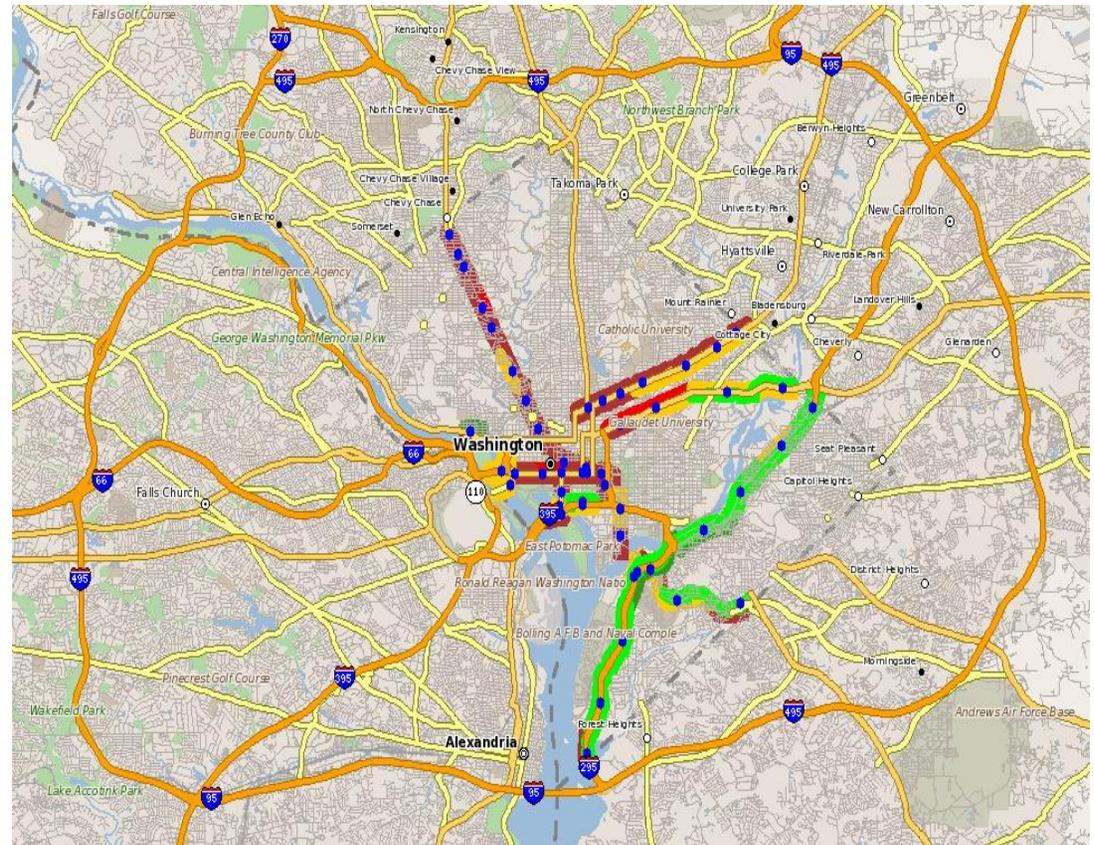
- Travel Times
  - Install sensors every mile or less
  - Utilize data for CMS/DMS presentation of times
  - Utilize data for TMC Operations, Highway/State Patrol, Accident Response
  - Utilize data for 511 Traveler Information System

- Construction Zone Safety or By-Pass Road Congestion Mgmt

- Incident Detection
  - Real-time alerts to speed changes
  - Automatically drive video camera response
  - Alert responders and media

- Congestion Management (Operations)
  - Dynamic Ramp Metering
  - Congestion level pricing
  - HOV/HOT lane monitoring
  - Performance Metrics: congestion index and length, annual delay, cost of congestion, system bottlenecks, etc

- Emerging mobile platforms

I-80 at Ashby Ave East 3/17/06 (Friday)

AshbyEast Speeds 2 Days Ago
(in MPH)
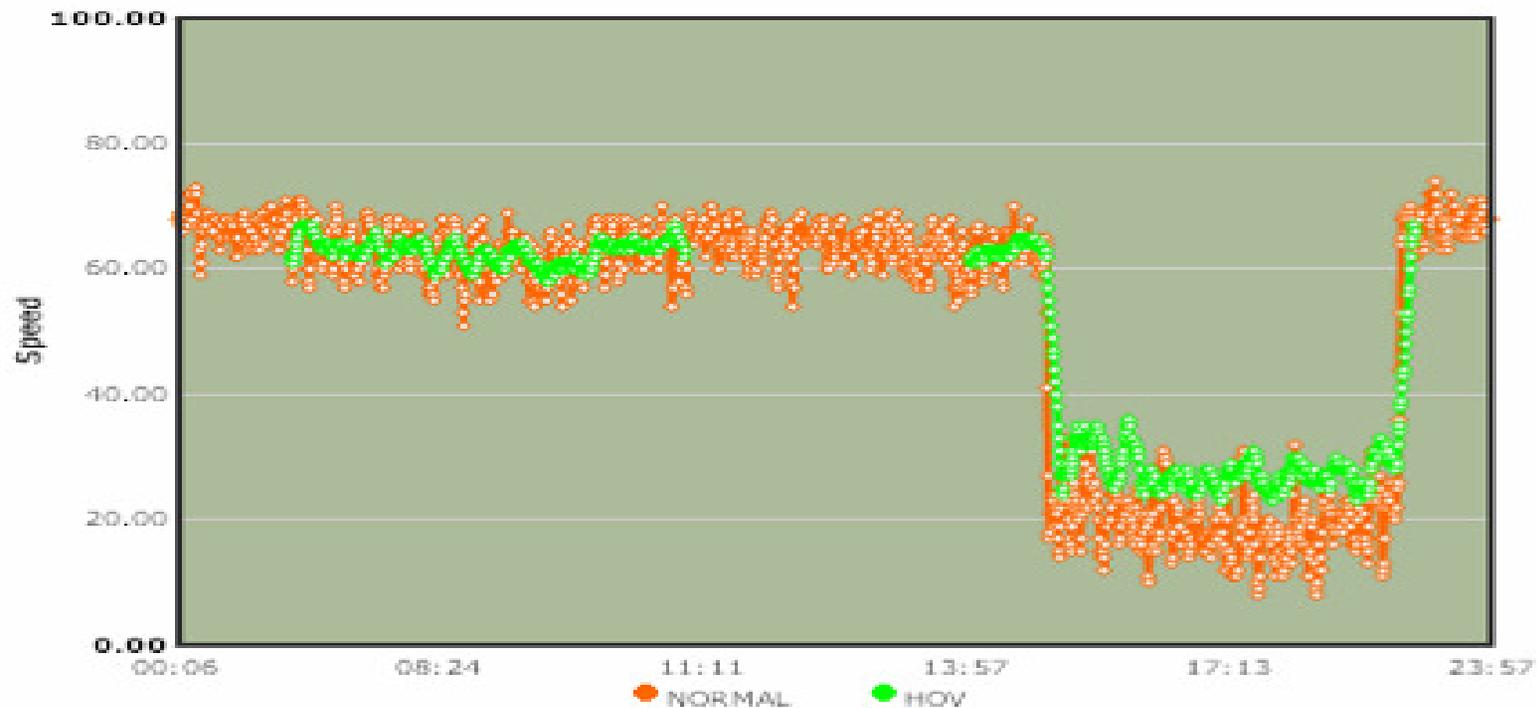
Source: SpeedInfo

I-80 W @ MM 412.4 (DMS) 4/30/08

Source: SpeedInfo

SpeedInfo
DELIVERING DATA THAT KNOWS YOUR FLOW
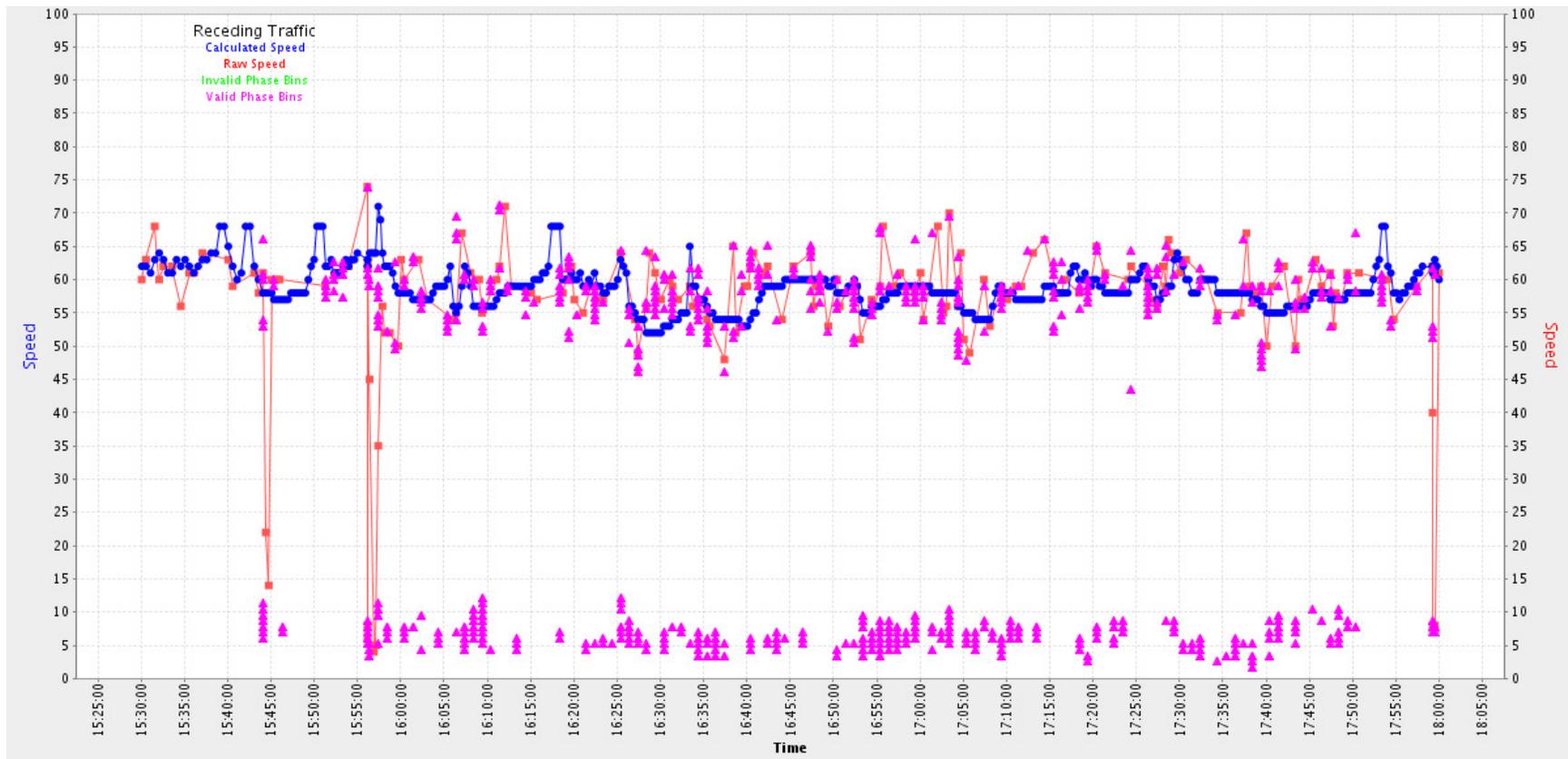
I-5 at Tacoma, WA 4/18/08 (Friday)
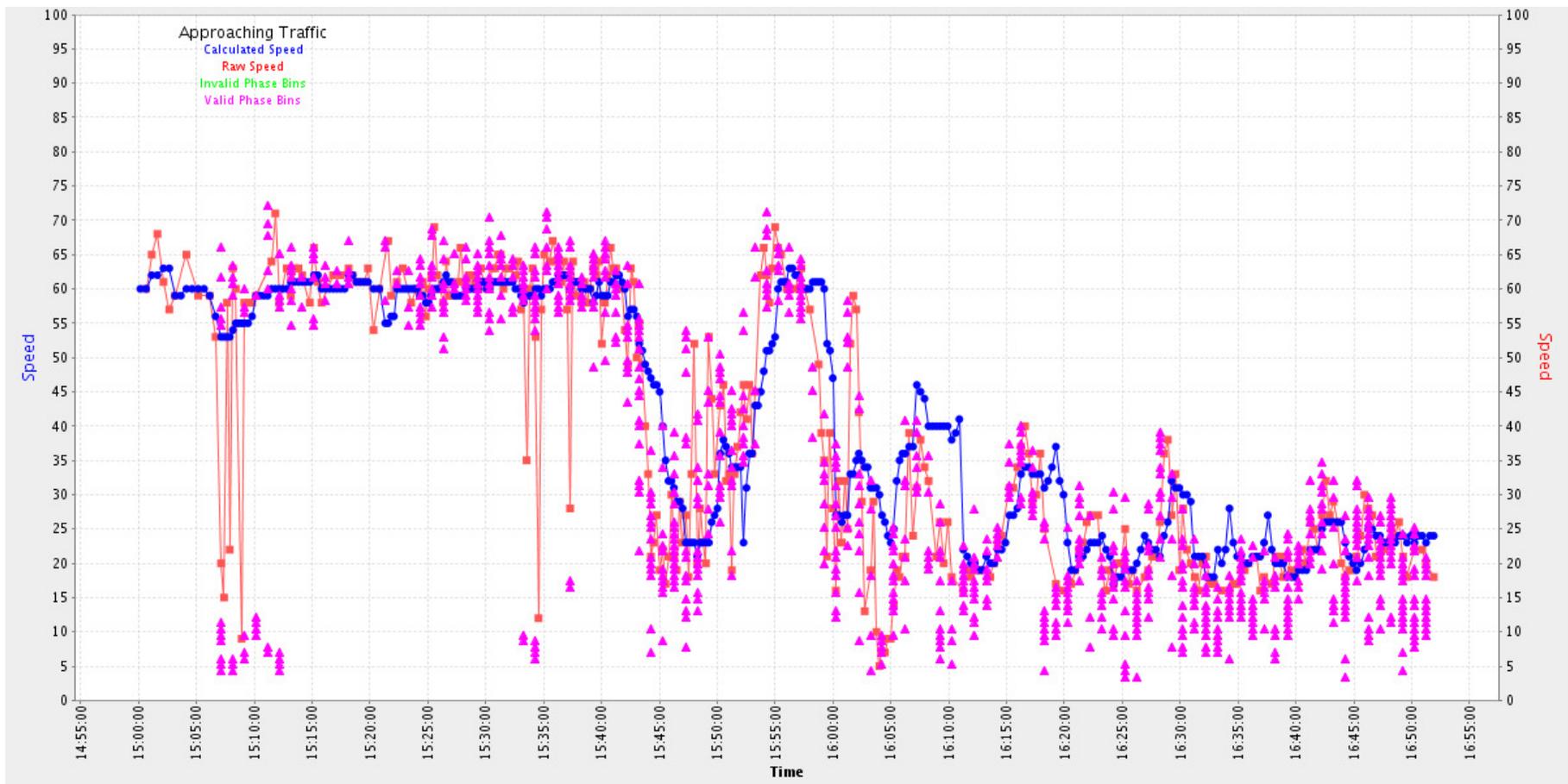
Source: SpeedInfo
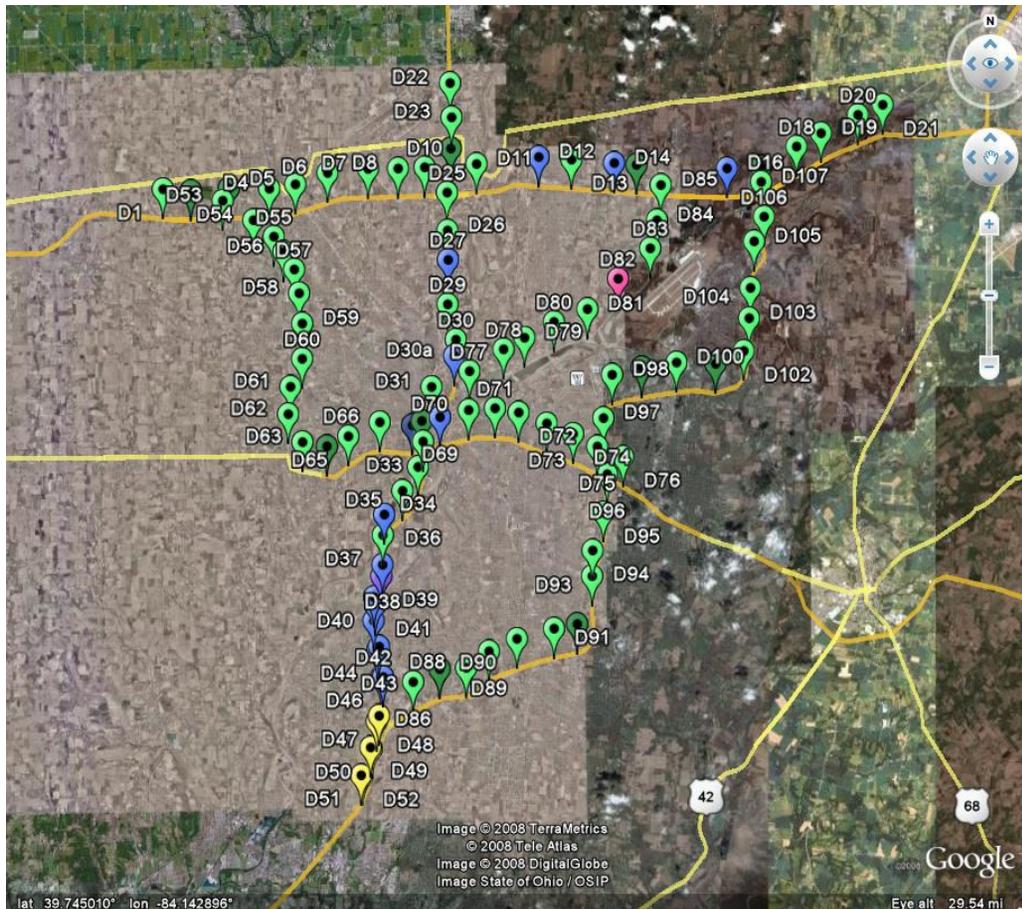
- Installed -Aug 2008
- 110 sensors
- Install time – 2 weeks
- ODOT Traffic Engineering
- SpeedInfo supplies Speed and Travel Times
- Data Supports –
  - Buckeye Traffic 511
  - DMS/CMS
  - HAR FM

	ERROR	DATA TABLE				
	TOTAL - OVERALL					
	MM 55	MM 55.8	MM 57.6	North	South	Total
	8.13%	8.50%	10.10%	9.04%	8.72%	8.91%
By Direction	TOTAL - NORTH					
	MM 55	MM 55.8	MM 57.6	Total		
	7.79%	8.63%	10.69%	9.04%		
	TOTAL - SOUTH					
	MM 55	MM 55.8	MM 57.6	Total		
	8.47%	8.37%	9.52%	8.78%		
By Date	7/17/2007					
MM 55	MM 55.8	MM 57.6	North	South	Total	
6.68%	8.60%	8.73%	8.74%	7.27%	8.00%	
	7/19/2007					
MM 55	MM 55.8	MM 57.6	North	South	Total	
9.81%	9.35%	10.76%	9.25%	11.20%	10.07%	
	8/15/2007					
MM 55	MM 55.8	MM 57.6	North	South	Total	
8.70%	8.76%	10.62%	10.18%	8.44%	9.34%	
	8/24/2007					
MM 55	MM 55.8	MM 57.6	North	South	Total	
7.01%	7.05%	10.25%	8.93%	7.20%	8.09%	

Error Sources – First Pass

- Stop and Go Traffic
- Cosine Error
- Sensor Placement
- Statistical Variation
- Laptop clock error
- Driver variables

Expected results – Next Pass

- Algorithm improvements for stop and go traffic
- Improve GPS probe accuracy using direct real-time GPS speed
- Expected error – < 5%

* source: Ohio DOT

SpeedInfo
DELIVERING DATA THAT KNOWS YOUR FLOW

Dayton Travel Time Verification

Date	Time	Road	Direction	Segment	Actual Travel Time by Floating Car Method	Speed Info Travel Time
9/12/2008	9:16 AM	I-70	W	SR4 (South) to SR 4 (Enon)	5.9	6
9/12/2008	9:16 AM	I-70	W	SR 49 to I-75	8	8
9/12/2008	9:16 AM	I-70	W	I-75 to SR 4 (Enon)	12.8	13
9/12/2008	10:38 AM	I-675	S	I-75 to US-35	12.1	12
9/12/2008	10:38 AM	I-675	S	US-35 to I-70	12.3	13
9/12/2008	12:44 PM	I-75	S	I-70 to County Line (Miami)	3.7	3
9/12/2008	12:44 PM	I-75	S	County Line (Warren) to I-675	2.3	NOT-AVAILABLE
9/12/2008	12:44 PM	I-75	S	County Line (Warren) to US-35	11.5	13
9/12/2008	12:44 PM	I-75	S	US-35 to I-70	9.5	10
9/12/2008	12:44 PM	I-75	S	US-35 to SR-4	2.1	2
9/12/2008	12:44 PM	I-75	S	I-675 to US-35	9.1	10
9/12/2008	12:44 PM	I-75	S	US-35 to County Line (Miami)	13.1	14
9/12/2008	11:10 AM	I-75	N	I-70 to County Line (Miami)	3.6	3
9/12/2008	11:10 AM	I-70	N	County Line (Warren) to I-675	2.5	NOT-AVAILABLE
9/12/2008	11:10 AM	I-70	N	County Line (Warren) to US-35	10.8	13
9/12/2008	11:10 AM	I-70	N	US-35 to I-70	8.8	9
9/12/2008	11:10 AM	I-70	N	US-35 to SR-4	2.3	2
9/12/2008	11:10 AM	I-75	N	I-675 to US-35	8.4	9
9/12/2008	11:10 AM	I-70	N	US-35 to County Line (Miami)	12.4	11

Results – 2nd Pass

• Java client algorithm improvements for stop and go traffic and milepost information

• Without "no car" individual sensor adjustments

•Testing continues to include more rain and stop and go traffic

• Error – < 5%

* source: Ohio DOT

SpeedInfo technology application supports a unique business model

- Public-Private partnership based on DOTs funding/financial model

- Equipment Purchase or Data Service with/without data sharing
  - Capital purchase, service contract, lease, rent, private industry pay or free

- Turn-key Data Service includes:
  - Service Level Agreements with availability guarantee and penalty
  - All installation, communication and maintenance costs
  - Low monthly payment or pre-pay

- Data sharing provides for private sector offsetting DOT costs
  - Use data rights to limit costs or not

	Private	Partnership	Public
Funding	100% Industry	50% / 50% Split	100% Government
Commercial Data	Radio / TV Web Subscribers	Web Subscribers	
Public Data Use	Operations Emergency 511 Phone	Add: 511 Web CMS	Unrestricted
Public Savings	100%	95%	90%

- Leverage network infrastructure and design to manage additional detection technologies:

    – Car counting and classification
    – Camera to capture pictures on demand
    – Road surface temperature sensor
    – Micro-climate weather conditions

- Designed to support optional communication platforms

- Data Warehousing and Analysis

THANK YOU

Doug Finlay
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